Bridge Company, and is now a professor in Sibley College, Cornell University, His experience, therefore, leads us to expect that his volume will contain much matter of service to structural draughtsmen, and that the treatment will be suitable for students. The early demand for a second edition is evidence that the author has been successful in his treatment, and this is confirmed by inspection of the text. The book does not pretend to deal with the mechanics of materials —the student is referred to other books for this —and the reader who has studied materials will find his knowledge drawn upon throughout the book in application to a large number of structures. Sufficient is given at every step to enable the student to understand which particular theory is being applied. There are practical examples, fully worked out, of every class of structure discussed, and the formulæ used in practice are explained clearly. A large number of exercises to be worked by students is included.

Although the methods of design are American, the British student and designer of structures will profit considerably by going through this volume. We have read chapters xvii. and xviii. with particular interest; these deal respectively with retaining walls and with bins for holding grain and coal; the latter chapter is exceptionally complete, and, as is usual throughout the book, contains typical examples worked out.

Rambles in the Vaudese Alps. By F. S. Salisbury. Pp. x+154. (London: J. M. Dent and Sons, Ltd., 1916.) Price 2*s.* 6*d.* net.

MR. SALISBURY's book gives a pleasant account of a summer holiday in 1908, spent at Gryon in unambitious excursions among the limestone Alps of the western Oberland. The fine views of such mountains as the Diablerets and the Grand Muveran, in the immediate neighbourhood, and the magnificent gable-end of the Dent du Midi on the other side of the Rhone, as they rise above slopes of green pasture and dark pine-wood, make this an unusually attractive district.

The author writes, not for geologists or botanists, but for lovers of mountain scenery and mountain flowers. As, however, he did not reach Gryon until the beginning of August, he was too late for the blossoms which, some five or six weeks earlier, make the meadows, from three to five thousand feet above sea-level, a carpet of many colours. These, in that month, have given place to less graceful kinds, such as the yellow and purple gentian, the white hellebore (*Veratrum album*), and the monkshood. But his visits to the summits and passes, some three thousand feet above the level of Gryon, were rewarded by such lovers of the mountain air as the *Dryas octopetala* and the alpine aster, the little blue gentians, and even the edelweiss. Some photographs of the flowers, by Mr. Somerville Hastings, add to the interest of the book, and it is one which the tourist who loves to linger rather than to hurry, and desires to learn a little about the plant world of the Alps, will find a useful and attractive companion.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Zeppelin Notes.

As one who happened to be in a region which came in for attention from Zeppelin bombs, I have jotted down some of the points of more immediate interest which stand out from an experience in which everything was rather blurred:—

The bombs could be heard approaching as they rushed through the air. The whistling noise—a little like the tearing of calico or the noise made by a gigantic rocket—became a crescendo shriek of terrific intensity just before the bomb struck the ground and the explosion occurred. In the present instance I estimated the height of the Zeppelin as about 4000 ft., and, neglecting air resistance, this would give the bombs a final velocity of about 500 ft. per second. The actual speed was probably less than this, and is considerably less than the velocity of sound (1100 ft. per sec.), which accounts for the fact that the bombs can be heard before their arrival.

Standing as I was at about 200 yards from where one of the bombs fell, the noise of the actual explosion did not appear to be very loud. The reason is probably to be sought in the almost complete numbing of one's senses. All one could do was to stand stockstill and wait for the next bomb. The feeling was much the same as if one had been given a hard blow between the eyes with a bolster or some relatively soft object. I heard a piece of bomb "zip" past me, and afterwards found it embedded in a balk of timber about two yards from where I was standing. A huge cloud of black smoke arose into the air, reminding one of the photographs of Jack Johnson shells bursting.

The results of an explosive bomb show curious freakishness, especially in enclosed spaces. Evidently "pockets" of high pressure result in various directions, and the destruction is confined to the direction of these pockets. Considerable damage may be caused apparently by the air rushing in to restore the pressure after a high-pressure wave has passed forward. For example, one bomb fell near a small outhouse. The doors were blown bodily inwards—mostly owing to the hinges and frames breaking loose—yet the surrounding wall of the house was "started" outwards. One pane of glass in a window-frame disappeared, while an adjacent pane similarly situated was undamaged. The lid of a kettle was deftly blown off by the air wave going down the spout, the kettle being undamaged.

The bombs fell in soft marshy ground, and the effects of the explosion were very local. Apart from flying missiles, the danger zone did not appear to exceed 25 yards or so. Windows, about 15 yards away, on the side of an outhouse remote from the explosion were quite intact.

Pieces of one of the explosive bombs perforated some steel plates standing vertically about 10 yards away. The edges of the holes were rounded, and showed undoubted signs of fusion, due no doubt to the speed of the shearing. In one instance a piece of the phosphor-bronze casing of the bomb penetrated a steel plate more than 1 in. thick.

The holes caused in the soft clayey ground by the explosive bombs were approximately conical, some 10 ft. across, and about 4 ft. deep.

The incendiary bombs could be heard coming with

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a whizzing noise, rather like the explosive bombs. They blazed furiously, and lit up the whole neighbourhood. We had, however, no great difficulty in extinguishing one with a hand fire-extinguisher. They contain, I imagine, tar, petrol, and much besides.

The rapid succession of the bombs and the spacing apart of the holes showed that the Zeppelin was travelling at high speed at the time, due no doubt to the activity of the anti-aircraft guns. She could not have hoped to hit any specific object, and, indeed, ludicrously failed to hit anything but clay.

The control of the airship was considerable. She was very nimble in endeavouring to evade the searchlights, which, however, had no difficulty whatever in keeping her in the beam.

OBSERVER.

THE KIMMERIDGE OIL-SHALES.

THE rapid extension of the use of oil fuel in the Navy, coupled with the desirability, for obvious reasons, of securing adequate supplies from home sources, has led to renewed attention being given to the large and easily accessible deposits of oil-bearing shales which have long been known to occur in the vicinity of Kimmeridge, in Dorsetshire, and there is reason to believe that the question of their immediate utilisation has already been urgently pressed upon the notice of the Admiralty.

Assuming that oil of a satisfactory character can be obtained from these shales, there are several considerations which would seem to point to Kimmeridge itself, or some place in its near vicinity, as a suitable spot at which to establish workings, not the least important of which is its proximity to Portland, one of our leading naval stations. Kimmeridge is close to the coast, and although somewhat exposed to gales from the south-west, might be made sufficiently secure as a harbour to enable shipments of the shale to be made to Castletown, or other convenient locality, if it were found impracticable to distil the shale near the place where it is raised. And in any case, should difficulties be found in making the Kimmeridge haven sufficiently safe for vessels to lie at anchor or alongside the jetty that would have to be constructed, Portland Harbour of Refuge is only a few miles distant, and can be entered at any time of tide, and in any weather.

Many attempts have been made to work the Kimmeridge shales for oil, but hitherto without much success, owing largely to the character of the product and the difficulty of rectifying it into a marketable product as naphtha and illuminating oil. But the nature of oil fuel is wholly dissimilar from that of ordinary burning oil, and its chemical and physical characters are quite different. Nor is the same standard of quality as regards colour, freedom from sulphur, etc., needed in a fuel oil as in an oil intended for illuminating purposes. Hence it is possible that there may be an outlet for the Kimmeridge oil that has hitherto been denied it.

The Kimmeridge shales have long received the attention of geologists, and their extent and distribution have been carefully traced. The outcrop along the Dorsetshire coast begins a mile or two to the west of St. Alban's Head, and, as seen from the sea, forms a very striking natural feature as Kimmeridge is approached. The deposits extend to very considerable distances, and are of unknown depth. To the west they are found at Portland, which, indeed, is known to rest upon them, and they were formerly worked for fuel in the island. They come out here and there along the West Bay, or in its vicinity, as far as Abbotsbury. They have been known in times past to ignite spontaneously, probably owing to the heat developed by the rapid oxidation of marcasite, or some other form of iron pyrites. They extend to the north of Dorsetshire, and have been traced by borings and by outcrops in a north-easterly direction to Norfolk, and through Lincolnshire to the Humber.

In the neighbourhood of Kimmeridge the shale was long used as fuel, and is still so used to a limited extent in the country cottages. In the sixteenth and seventeenth centuries it was worked for alum as at Whitby, and by the same methods, the large quantity of pyrites it contains affording the sulphuric acid, whilst other portions served as fuel for evaporation, etc.

The shale seems to have been first worked for oil about 1848, when small shipments were sent to Weymouth, where the retorting was done—a fact which was held, although unsuccessfully, to invalidate Young's patent for the manufacture of paraffin oil by destructive distillation at a low temperature. At the famous trial Vice-Chancellor Stuart ruled that "the manufacture of offensively-smelling and unmarketable oils from Kimmeridge shales could not be held to be an anticipation of Young's patent." It is, however, interesting to note that Weymouth was the first place in the United Kingdom at which the distillation of shale for the production of hydrocarbon oils was attempted on a manufacturing scale.

In addition to oils of various grades the shales yield notable quantities of ammonia on distillation, a fact which has an important bearing upon their commercial value.

In a highly interesting and suggestive paper recently read to the Institution of Petroleum Technologists, Mr. W. Hardy Manfield has given a very full account of the Kimmeridge oil-shales, their distribution and geological features, and of the various attempts which have been made to turn them to account. The communication also gives a description of the methods of winning oil-shale, of distilling it, and of treating the products, based upon practical experience. The paper is particularly valuable on account of the author's local knowledge of the Kimmeridge deposits.

The great objection to the use of Kimmeridge oil is due to the large quantity of sulphur it contains, which it has hitherto been practically impossible to remove to a sufficient extent to make the oil marketable. All attempts at purification by the methods of treatment ordinarily used—mainly acid and alkali—are of little value. The

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